

Optical Flywheel for Yb+ Ion Clock, Phase I

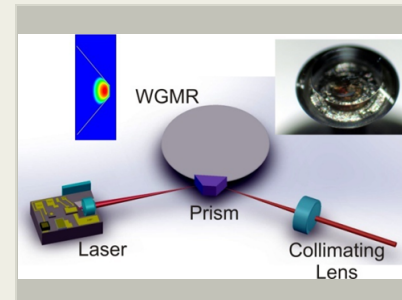
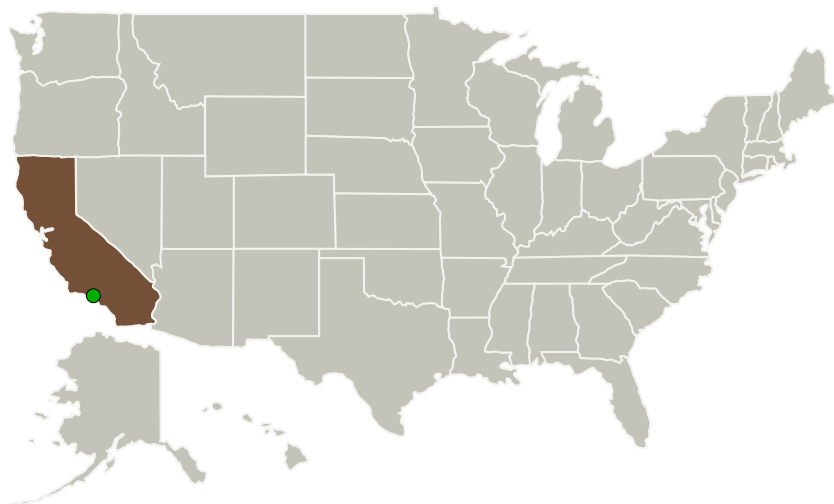
Completed Technology Project (2017 - 2017)



Project Introduction

OEwaves Inc. offers to develop and demonstrate an extended cavity ultra-stable 436 nm diode laser system that features the properties required for long duration space applications. The system will be based on a semiconductor laser locked to a monolithic microcavity using self injection locking technique. This technique results in a complete suppression of mode hops in the laser during its operational lifetime. The microcavity will not only stabilize the frequency of the laser, but will also be used to measure and stabilize the power of the laser. Furthermore, the microcavity provides a modulatable laser that features exceptionally low residual amplitude modulation, allowing a robust lock to the clock transition of interest. The laser is intended as an optical local oscillator (LO) suitable for Yb+ ion clock. The LO will include a semiconductor diode laser stabilized to a millimeter scale monolithic reference resonator. The reference resonator is a high quality factor (Q) and narrow-linewidth dielectric whispering gallery mode (WGM) resonator that is thermally compensated to produce a vanishingly small temperature coefficient. The LO will deliver the same performance as the best existing high-end laboratory Fabry-Perot resonator-based LOs--which are large, expensive, and fragile table-mounted instruments--but in a robust, 100 cc volume module that is inexpensive and consumes small power.

Primary U.S. Work Locations and Key Partners



Optical Flywheel for Yb+ Ion Clock, Phase I Briefing Chart Image

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Optical Flywheel for Yb+ Ion Clock, Phase I

Completed Technology Project (2017 - 2017)

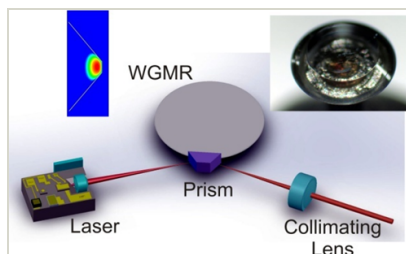


Organizations Performing Work	Role	Type	Location
OEwaves, Inc.	Lead Organization	Industry	Pasadena, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California

Images



Briefing Chart Image

Optical Flywheel for Yb+ Ion Clock,
Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/132910>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

OEwaves, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

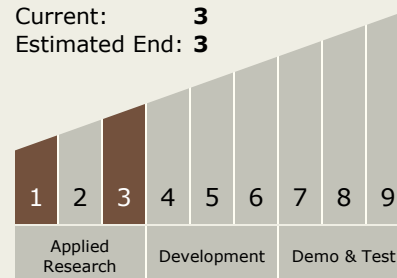
Carlos Torrez

Principal Investigator:

Andrey Matsko

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Optical Flywheel for Yb+ Ion Clock, Phase I

Completed Technology Project (2017 - 2017)



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.4 Network Provided Position, Navigation, and Timing
 - └ TX05.4.1 Timekeeping and Time Distribution

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System